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Doubtless few teachers will want to follow exactly this course, nor does the author expect them to do so; but many will certainly derive great help by selecting from it the topics appropriate to their own conditions and having clearly before them the didactic value of the laboratory work.

It may be worth while to point out that the author's principles, which one cannot escape, do not compel the conclusion that it is best to begin the elementary course with a study of seeds. The teacher who now begins by introducing the student to the simple algæ need not feel that he must abandon this method. The excellent principles presented in the second essay may be as well developed by another method. And it is only fair to say that Professor Ganong advises each teacher to make out his own course.

University men will do well to read Dr. Ganong's essays and recommend the book to every teacher of botany.—C. R. B.

Buds and stipules.

SIR JOHN LUBBOCK has published a book with the above title in the well-known International Scientific Series.¹ There is little or no attempt to give anything new, but rather to place before the world in a somewhat popular style the most interesting results of his previous study.²

The author was led to study stipules by the observation of Vaucher that some rock-roses have stipules and others not; the question arose: why? The study of stipules led on to a study of buds, especially their protective structures.

The order of the chapters does not seem particularly logical, and there appears to be more repetition than is needed, even in a popular work. The first two chapters deal in a general way with buds and stipules; the third with the development of leaves and stipules, *i. e.*, their organogeny. The fourth chapter takes up the protection of buds, which may be by older leaves, leaf bases or petioles, stipules, hairs, resins. Detailed examples are given under each head. The author thinks that the shape of leaves is often determined by the shape of the bud or seed, and he attempts to explain in this way why some leaves are lobed and others not. For example, oak buds are short, the leaves are folded in the bud, and hence are lobed. There is possibly a confusion here between *post hoc* and *propter hoc*.

There is a long chapter on the structure of buds, many species being mentioned. Chapter six treats of the forms of stipules, and it is shown how great a variety there is. In the seventh chapter the author discusses the subsidiary uses of stipules. Their general use he conceives to be to cover and protect the buds. They are often important also as organs of photosynthesis;

¹ LUBBOCK, JOHN: On buds and stipules. Crown 8vo. pp. xix + 239. *pl.* 4, *figs.* 340. London: Kegan Paul, Trench, Trübner & Co. L't'd. 1899. 5s.

² On stipules. Parts I-IV. Jour. Linn. Soc. Bot. 28, 30, 33. 1890, 1894, 1897.

they may become tendrils, or spines, or glandular organs; or they may be rudiments, looking back to organs of use in another form.

There is a chapter also on the nature of stipules. There are three views as to what stipules are: (1) they are appendages of the leaves (Van Tieghem, Baillon, Gray); (2) they are autonomous organs, analogous to leaves (Lindley); (3) they are an integral part of the leaf. Lubbock holds the third view. The first view he regards as untenable because stipules originate independently of leaves and often before them; the second because the stipule bundles are derived from the foliar bundles.

The book is full of illustrations and very suggestive, though it seems that there is too great a certainty as to just what everything is for.—HENRY C. COWLES.

An ecological text-book.

AMONG THE recent text-books for secondary schools none is so dominated by the new ecological standpoint as the book just issued by Dr. John M. Coulter. This is one of the series of "Twentieth Century Text-books," in course of publication by Messrs. D. Appleton & Co.³

It is the first of a pair of books, each representing work for half a year, but independent. The second, with the title *Plant Structures*, is to be issued shortly. It is to be dominated by morphology as the first is dominated by ecology. In the judgment of Dr. Coulter the order in which he issues the books is the proper one for presentation in an elementary course. This sequence is likely to meet with the criticism that the student, in ignorance of plant structure and without wide acquaintance with plant groups, is unable to appreciate ecological phenomena and principles. The author believes the advantages which counterbalance the disadvantages are (1) the obtaining of a true conception of plants in nature, (2) acquaintance with the large problems of plant physiognomy, and (3) the avoidance of the use of the compound microscope at the outset.

Though the physiognomy of vegetation is an interesting and perhaps most important phase of botany, it is doubtful whether at the present time the subject is well enough organized to justify its dominating an elementary course. It is still more doubtful whether it will be possible for many years to find teachers capable of presenting it. Granting the ecological aspect to be the ideal botanical course, the question is whether we are yet far enough away from the floristic or pseudo-taxonomic teaching to justify an attempt to reach so remote an ideal. The writer has already committed himself to the view that the simpler morphology and physiological topics should be first presented in an elementary course and therefore only states the pedagogical

³COULTER, J. M.: *Plant Relations*, a first book of botany. 12mo. pp. x + 264. *figs.* 206. New York: D. Appleton & Company, 1899.